

King County Industrial Waste Program (KCIW)

Information about volatile organic compound screening levels

9/22/09

How KCIW Determines organic compound discharge limits:

The local limit for organic compounds prohibits the discharge of any organic pollutant that results in the presence of toxic gases, vapors, or fumes within a public or private sewer or treatment works in a quantity that may cause worker health and safety problems. The local limit also provides the authority to use various methods (applied on a site-specific basis) for limiting the discharges of organic compounds. The need for restrictions must be based on a site-specific evaluation as described in the following table.

Elements in a Site-Specific Evaluation of Organics

A site-specific evaluation includes these elements:	Conditions in public or private sewers downstream of the discharge, including dilution by other wastes upstream. Worker safety and public health standards. Type of chemical compound. Proximity to other discharges that may cause adverse conditions in combination with the discharge. Technological achievability of removal. Potential impacts to public, private, or side sewers; treatment works; sludge; or receiving waters. The duration of the discharge.
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Discharge Screening for Volatile Organic Compounds

Most frequently, the highest concentrations of organic compounds are found in the discharges from groundwater remediation facilities, waste treatment facilities, and in landfill leachate.

Screening levels in the following table have been calculated for many of the volatile organic compounds that are commonly used in industries and have Washington State permissible exposure limits (PELs) per Chapter 296-62 WAC (General Occupational Health Standards). Screening levels are the concentration in the wastewater that could potentially produce sewer gas concentrations in excess of the PEL. The calculations of the screening levels are based on Henry's law equilibrium between the volatile organic compound in the wastewater and the sewer gases.

The screening also assumes that:

- There is no venting in the collection system.
- There is a continuous flow of the volatile organic compound.
- There is adequate retention time to complete the equilibrium between the sewer gases and the wastewater.

Discharge Screening Levels for Volatile Organic Compounds Based on Occupational Standards and Henry's Law Constants

Compounds	CAS-RN	PEL (mg/m ³)	Henry's Law Constant (mg/m ³)/(mg/l) (A)	Discharge Screening Level (mg/l)
Acrolein	107-02-8	0.8	4.9	0.16
Acrylonitrile	107-13-1	4.34	4.5	0.96
Benzene	71-43-2	16	228	0.070
Bromoform	75-25-2	5	22.8	0.22
Carbon disulfide	75-15-0	36	490 (B)	0.073
Carbon tetrachloride	56-23-5	12.6	1185	0.011
Chlorobenzene	108-90-7	350	151	2.3
Chloroethane (Ethyl chloride)	75-00-3	2600	449	5.8
Chloroform (Trichloromethane)	67-66-3	9.78	163.5	0.060
Dichloroethane, 1,1-	75-34-3	400	240.4	1.7
Dichloroethane, 1,2- (Ethylene dichloride)	107-06-2	8	48.1	0.17
Dichloroethylene, 1,1- (Vinylidene chloride)	75-35-4	4	1202.1	0.003
Dichloroethylene, 1,2- (Total - <i>cis</i> & <i>trans</i>)	540-59-0	790	389.3	2.0
Dichlorodifluoromethane	75-71-8	4950	121801 (B)	0.041
Dichloropropane, 1,2- (Propylene dichloride)	78-87-5	350	118.5	3.0
Dichloropropene, 1,3-	542-75-6	5	55.3 (B)	0.090
Ethyl benzene	100-41-4	545	327	1.7
Methyl bromide (Bromomethane)	74-83-9	20	255.5	0.078
Methyl chloride (Chloromethane)	74-87-3	210	371.6	0.57
Methylene chloride	75-09-2	434	104.8	4.1
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1	300	20 (C)	15
Naphthalene	91-20-3	75	19.62 (B)	3.82
Nitrobenzene	98-95-3	5	0.53 (B)	2 (D)
Tetrachloroethane, 1,1,2,2-	79-34-5	7	18.6	0.38
Tetrachloroethylene (Perchloroethylene/PCE)	127-18-4	170	717.1	0.24
Toluene	108-88-3	375	272.5	1.4
Trichloroethane, 1,1,1- (Methyl chloroform)	71-55-6	1900	692.7	2.7
Trichloroethane, 1,1,2-	79-00-5	45	34.1	1.3
Trichloroethylene (TCE)	79-01-6	270	408.7	0.5 (D)
Vinyl chloride	75-01-4	12.8	1048	0.012
Xylenes, Total-	1330-20-7	655	300 (C)	2.2

Notes:

(A) - Local Limits Development Guidance (EPA, 2004)

(B) - Guidance to Protect POTW Workers From Toxic And Reactive Gases And Vapors (EPA, 1992)

(C) - TOXCHEM (v. 3) Wastewater Model - Enviromega, Inc.; Ontario, Canada; T: 905-689-4410

(D) - Chapter 173-303 WAC - Dangerous Waste Regulations

CAS-RN - Chemical Abstract Service - Registry Number

PEL – Permissible Exposure Limits (TWA or STEL) per WAC 296-62-07515

STEL - Short-Term Exposure Limit

TWA - Time-Weighted Average

Field-testing performed by KCIW revealed that actual sewer-gas concentrations are less than projections using the Henry's law equilibrium method. Therefore, the screening levels are not recommended as numerical limits, but rather should be used to evaluate the need for best management practices or other controls to protect worker health and safety. The first step in determining the need to control discharges of organic compounds should be to require representative sampling and analysis, and comparison of the results to screening levels. When the screening levels have been exceeded, KCIW has historically used a range of control methods, including the following:

- Using the AKART approach, by selecting the pretreatment method (e.g., carbon treatment or air stripping).
- Requiring air monitoring at the first potential occupational exposure point(s). Typically, IW has only required short-term samplings to determine if the sewer gas exceeds occupational standards.
- Requiring ongoing wastewater sampling and comparing the results with the screening levels.
- Requiring implementation of best management practices to reduce the amount of organics discharged into the sewer.

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